

In the claims:

1. A frame transfer method in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising the steps of:

5 adding, to applied said data frame, an expansion tag containing information about forwarding to an egress edge node to said destination to make an expansion frame, and

10 relaying said data frame based on said forwarding information of said added expansion tag to transfer the frame to said egress node by each node on said network.

2. A frame transfer method in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising the steps of:

5 adding, to applied said data frame, an expansion tag containing information about forwarding to an egress edge node to said destination and information about customers to which said source and said destination belong to make an expansion frame, and

10 relaying said data frame based on said forwarding information of said added expansion tag to transfer the frame to said egress node by each node on said network.

3. A frame transfer method in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising the steps of:

5 when applied said data frame is a frame to be broadcast, adding, to said data frame, an expansion tag containing information about forwarding of an ingress node having received said frame to make an expansion frame, and

10 relaying said data frame based on said forwarding information of said added expansion tag to transfer the frame to each node on said network by each node on said network.

4. The frame transfer method as set forth in claim 3, wherein

said frame to be broadcast is set to be a frame whose output destination node is unknown.

5. The frame transfer method in the network as set forth in claim 1, wherein

at an ingress node of the source of said data frame on said network, said expansion tag is generated based on network information of said data frame and generated said expansion tag is added to make said expansion frame.

6. The frame transfer method in the network as set forth in claim 1, wherein

at said egress node on said network, said expansion tag is deleted from said expansion frame to make said data frame and said data frame is transferred to said transfer destination.

5 7. The frame transfer method in the network as set forth in claim 1, wherein

said data frame is an Ethernet frame.

8. The frame transfer method in the network as set forth in claim 6, wherein

a VLAN tag of said Ethernet frame is replaced by said expansion tag to make said expansion frame.

5

9. The frame transfer method in the network as set forth in claim 7, wherein

5 said expansion tag is inserted immediately after a source MAC address of said Ethernet frame to make said expansion frame.

10. The frame transfer method in the network as set forth in claim 7, wherein

when said Ethernet frame fails to have said VLAN tag, said expansion tag is added between a source MAC address and Ethernet attribute information to make said

5

expansion frame.

11. The frame transfer method in the network as set forth in claim 1, wherein

5 said forwarding information is identification information composed of identifier information of said egress node or label information for reaching said egress node.

12. The frame transfer method in the network as set forth in claim 1, wherein

5 said forwarding information is identification information composed of identifier information of said egress node or label information for reaching said egress node and additionally identifier information of said ingress node.

13. The frame transfer method in the network as set forth in claim 3, wherein

5 said forwarding information is identification information composed of identifier information of said ingress node.

14. A frame transfer method in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising the steps of:

5 applying a data frame with a VLAN tag added onto  
said network by an ingress node of said source, and  
broadcast-transferring said data frame along a  
broadcast path based on information stored in said VLAN  
tag to transfer the frame to said egress node by each  
10 node on said network.

15. The frame transfer method as set forth in claim  
14, wherein

5 a range of tag values added to said data frame is  
divided into a range of a value for use as forwarding  
information of said expansion tag and a range of a value  
for use as said VLAN.

16. The frame transfer method as set forth in claim  
15, wherein

5 when a value of a tag added to said data frame is  
within the range of a value for use as said expansion  
tag, transfer is conducted based on the forwarding  
information of said expansion tag and when the value is  
within the range of a value for use as said VLAN tag,  
broadcast-transfer is conducted based on the information  
of said VLAN tag.

10

17. The frame transfer method as set forth in claim  
16, wherein

the range of a value for said VLAN tag is further

5 divided into a plurality of ranges to set a broadcast path for each of the plurality of ranges.

18. The frame transfer method in the network as set forth in claim 1, wherein

5 a length of said expansion tag is 32 bits and a length of a storage region of said expansion tag is an integral multiple of 32 bits.

19. The frame transfer method in the network as set forth in claim 1, wherein

5 said ingress node in said network has a table which makes an address of said transfer destination and identification information of said egress node correspond with each other and a table which makes identification information of said egress node and output port information correspond with each other,

10 a core node in said network has a table which makes identification information of said egress node and output port information correspond with each other, and

15 said egress node has a table which makes an address of said transfer destination and output port information correspond with each other and a table which makes identification information of said egress node and output port information correspond with each other.

20. The frame transfer method in the network as set

forth in claim 1, wherein

5           said ingress node in said network has a table which makes an address of said transfer destination and identification information of said egress node correspond with each other, a table which makes identification information of said egress node and output port information correspond with each other, and a table which makes identification information of said 10 ingress node and one or a plurality of output port information correspond with each other,

15           a core node in said network has a table which makes identification information of said egress node and output port information correspond with each other and a table which makes identification information of said ingress node and one or a plurality of output port information correspond with each other, and

20           said egress node has a table which makes an address of said transfer destination and output port information correspond with each other, a table which makes identification information of said egress node and output port information correspond with each other and a table which makes identification information of said ingress node and one or a plurality of output port 25 information correspond with each other.

21.        The frame transfer method in the network as set forth in claim 20, wherein

identification information of said ingress node is an existing VLAN tag value or a group identifier obtained by grouping a part of existing VLAN tags or a group identifier obtained by grouping all the existing VLAN tags.

22. The frame transfer method in the network as set forth in claim 1, wherein

said ingress node in said network has a table which makes an address of said transfer destination, identification information of said egress node and customer information of said transfer destination correspond with each other and a table which makes identification information of said egress node and output port information correspond with each other,

10 a core node in said network has a table which makes identification information of said egress node and output port information correspond with each other, and

said egress node has a table which makes customer information of said transfer destination and output port information correspond with each other and a table which makes identification information of said egress node and output port information correspond with each other.

23. A network in which a plurality of nodes are connected with each other by a link, wherein

a part of nodes in physical connection of the

network are grouped into domains to make a higher-stage

5 hierarchical network for the physical connection,

a part of domains in said hierarchical network  
are grouped into higher-order domains to make a higher-  
stage hierarchical network for said hierarchical network,  
and

10 structure of said hierarchical network has an  
arbitrary number of hierarchies.

24. The network as set forth in claim 23, wherein  
located at a boundary between said domains is a  
link.

25. The network as set forth in claim 23, wherein  
located at a boundary between said domains is a  
node.

26. The network as set forth in claim 23, wherein  
located at a boundary between said domains are a  
link and a node together.

27. A frame transfer method in a network for  
transferring a data frame sent from a source on the  
network to a predetermined destination, comprising the  
steps of:

5 grouping a part of nodes in physical connection  
of the network into domains to make a higher-stage

hierarchical network for the physical connection, and  
grouping a part of domains in said hierarchical  
network into higher-order domains to make a higher-stage  
10 hierarchical network for said hierarchical network,  
thereby

forming said hierarchical network into a  
hierarchical network having an arbitrary number of  
hierarchies, and

15 adding, to applied said data frame, an expansion  
tag containing information about forwarding to an egress  
edge node to said destination to make an expansion frame,  
and relaying said data frame based on said forwarding  
information of said added expansion tag to transfer the  
20 frame to said egress node by each node on said network.

28. The frame transfer method in the network as set  
forth in claim 27, wherein

in an ingress node of a source of said data frame  
on said hierarchical network, said forwarding  
5 information includes identifier information of said  
egress node and identifier information of a domain in  
each hierarchy to which the egress node belongs, or  
additionally identifier information of said ingress node  
and identifier information of a domain in each hierarchy  
10 to which the ingress node belongs, and said forwarding  
information is stored in a plurality of expansion tags  
to make an expansion frame by adding said plurality of

expansion tags.

29. The frame transfer method in the network as set forth in claim 27, wherein

in each node on said hierarchical network, said data frame is relayed based on the forwarding information stored in an expansion tag at the top of said plurality of expansion tags added.

5 30. The frame transfer method in the network as set forth in claim 27, wherein

in each node on said hierarchical network, when a connection destination of an output port determined based on said top expansion tag is in a different domain, after deleting said top expansion tag, said data frame is relayed to the determined output port.

31. The frame transfer method in the network as set forth in claim 27, wherein

in said egress node on said hierarchical network, after deleting said expansion tag from said expansion frame to make said data frame, said data frame is transferred to said transfer destination.

32. The frame transfer method in the network as set forth in claim 27, wherein

said ingress node in said hierarchical network

5 has a table which makes an address of said transfer destination, identification information of said egress node and identification information of each domain to which the egress node belongs correspond with each other, and a table which makes identification information of said egress node, identification information of a domain in each hierarchy to which the egress node belongs and output port information correspond with each other,

10

a core node in said hierarchical network has a table which makes identification information of said egress node, identification information of a domain in each hierarchy to which the egress node belongs and output port information correspond with each other, and

15

20 said egress node of said hierarchical network has a table which makes address information of said transfer destination and output port information correspond with each other, and a table which makes identification information of said egress node, identification information of a domain in each hierarchy to which the egress node belongs and output port information correspond with each other.

25

33. The frame transfer method in the network as set forth in claim 27, wherein

5 said core node in said hierarchical network, when a connection destination node of an output port is in a different domain, additionally has a special flag as

output port information.

34. The frame transfer method in the network as set forth in claim 27, wherein each said node in said hierarchical network additionally has a special flag as output port information for node identification information of each node itself or for domain identification information of a domain to which the node itself belongs.

5 35. The frame transfer method as set forth in claim 27, wherein

said expansion tag is formed of an expansion tag identification region and an information storage region, and

5

stored in the expansion tag identification region is at least one of:

10 1) a forwarding tag indication bit indicating whether in said expansion tag storage region there exists an expansion tag other than a forwarding information tag in which transfer information of a frame with an expansion tag is stored,

15 2) a region end point indication bit indicative of an expansion tag accommodated at the end of said expansion tag storage region,

3) a reservation bit prepared for future expansion of functions,

4) a VLAN tag/expansion tag indication bit for expressing an expansion tag,

20 5) a tag type display region for displaying a kind of expansion tag, and

6) TTL (Time to Live) for counting the number of hops of said frame with an expansion tag,

25 or additionally a frame control information storage region in which a check code for checking an error of said expansion tag is stored.

36. The frame transfer method as set forth in claim 27, wherein

said expansion tag is formed of an expansion tag identification region and an information storage region,

5 and

stored in the expansion tag identification region is at least one of:

1) a forwarding tag indication bit indicating whether in said expansion tag storage region there exists an expansion tag other than a forwarding information tag in which transfer information of a frame with an expansion tag is stored,

2) a region end point indication bit indicative of an expansion tag accommodated at the end of said expansion tag storage region, and

5) a tag type display region for displaying a kind of expansion tag.

37. The frame transfer method as set forth in claim  
27, wherein

said expansion tag is formed of an expansion tag  
identification region and an information storage region,

5 the expansion tag identification region is  
located in the first half of the expansion tag and has a  
length of 16 bits,

10 the information storage region is located in the  
first half of the expansion tag and has a length of 16  
bits, and

15 stored in the expansion tag identification region  
are:

1) a forwarding tag indication bit indicating  
whether in said expansion tag storage region there  
exists an expansion tag other than a forwarding  
information tag in which transfer information of a frame  
with an expansion tag is stored,

20 2) a region end point indication bit indicative  
of an expansion tag accommodated at the end of said  
expansion tag storage region,

25 3) a reservation bit prepared for future  
expansion of functions,

4) a VLAN tag/expansion tag indication bit whose  
value expressing an expansion tag is fixed to 1,

5) a 4-bit tag type display region for  
displaying a kind of expansion tag, and

6) 8-bit TTL (Time to Live) for counting the  
number of hops of said frame with an expansion tag,  
said VLAN tag/expansion tag indication bit being  
30 stored at a position of the second to fourth bits from  
the top of the expansion tag identification region.

38. The frame transfer method as set forth in claim  
27, wherein

said expansion tag is formed of an expansion tag  
identification region and an information storage region,  
5 the expansion tag identification region is  
located in the first half of the expansion tag and has a  
length of 16 bits,

the information storage region is located in the  
first half of the expansion tag and has a length of 16  
10 bits, and

stored in the expansion tag identification region  
are:

1) a forwarding tag indication bit indicating  
whether in said expansion tag storage region there  
15 exists an expansion tag other than a forwarding  
information tag in which transfer information of a frame  
with an expansion tag is stored,

2) a region end point indication bit indicative  
of an expansion tag accommodated at the end of said  
20 expansion tag storage region,

3) a reservation bit prepared for future

expansion of functions,

4) a VLAN tag/expansion tag indication bit whose value expressing an expansion tag is fixed to 1,

25 5) a 3-bit tag type display region for displaying a kind of expansion tag, and

6) 8-bit TTL (Time to Live) for counting the number of hops of said frame with an expansion tag,

30 said VLAN tag/expansion tag indication bit being stored at a position of the second to fifth bits from the top of the expansion tag identification region.

39. The frame transfer method as set forth in claim

27, wherein

when including said forwarding information, said expansion tag is formed of an expansion tag

5 identification region and an information storage region, and

10 stored in the information storage region are an address type region for storing a kind of forwarding information tag in which transfer information of a frame is stored and an address region for storing transfer information of a frame.

40. The frame transfer method as set forth in claim

27, wherein

said expansion tag selectively includes: protection information including failure

5 information at the time of occurrence of a failure and protection path information for recovering from a failure,

10 quality information including a packet loss rate, frame arrival time into the network and bandwidth control information,

frame control information including a time to live of a frame in the network and information about error detection,

15 security information including information for ensuring reliability of a frame and secrecy at the time of setting up the network or at the time of changing a network structure, and

user expansion information including information arbitrarily defined by a user.

20 41. The frame transfer method as set forth in claim 27, wherein

said expansion tag selectively includes:  
forwarding information for transferring a frame  
5 to an egress edge node to a destination,  
broadcast forwarding information for transferring a frame to be broadcast to all the nodes on the network,  
customer separation information for  
discriminating customers to which a destination and a  
10 source of a frame belong,

OAM & P information for operating and managing

the network,

15        said protection information, said quality information, said frame control information, said security information and said user expansion information.

42.        The frame transfer method as set forth in claim 27, wherein

5        said expansion tag includes said forwarding information, said broadcast forwarding information, said customer separation information and said OAM&P information.

43.        The frame transfer method as set forth in claim 27, wherein

5        said expansion tag is formed of an expansion tag identification region and an information storage region, stored in said expansion tag identification region is 0x8100 which is a value of TPID prescribed by IEEE802.1Q or 0x9100 not prescribed or other value, and said information storage region is formed of a priority region prescribed by IEEE802.1Q, a CFI region and an expansion tag information storage region for storing information of said expansion tag.

10        44.        The frame transfer method as set forth in claim 27, wherein

      said expansion tag is formed of an expansion tag

identification region and an information storage region,

5                   the expansion tag identification region is located in the first half of said expansion tag and has a length of 16 bits and the information storage region is located in the latter half of said expansion tag and has a length of 16 bits,

10                  stored in said expansion tag identification region is 0x8100 which is a value of TPID prescribed by IEEE802.1Q or 0x9100 not prescribed or other value, and said information storage region is formed of a priority region prescribed by IEEE802.1Q, a CFI region and an 15                  expansion tag information storage region for storing information of said expansion tag.

45.               The frame transfer method as set forth in claim 43, wherein

5                   in the priority region of said information storage region, priority prescribed by IEEE802.1p is assigned to a part of priority values and to the remaining priority values, identification information of said expansion tag is assigned.

46.               The frame transfer method as set forth in claim 43, wherein

5                   in the priority region of said information storage region, priority prescribed by IEEE802.1p is assigned to four priority values and to the remaining

four priority values, identification information of said expansion tag is assigned.

47. The frame transfer method as set forth in claim 43, wherein

in the priority region of said information storage region, priority prescribed by IEEE802.1p is assigned to the priority values of 111, 101, 011 and 010 and to the priority values of 001, 000, 110 and 100, identification information of said expansion tag is assigned.

48. The frame transfer method as set forth in claim 43, wherein

among said priority values of said information storage region, 001 is information for discriminating said forwarding tag, 000 is information for discriminating said broadcast forwarding tag, 110 is information for discriminating a customer separation tag, and 100 is information for discriminating an OAM&P tag.

49. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

frame processing element which adds, to applied said data frame, an expansion tag containing information about forwarding to an egress edge node to said

10 destination to make an expansion frame, and  
switch element which receives said expansion  
frame to transfer the frame to a path to said egress  
node based on said forwarding information of said  
expansion tag.

50. A node in a network for transferring a data frame  
sent from a source on the network to a predetermined  
destination, comprising:

5 frame processing element which adds, to said data  
frame, an expansion tag containing information about  
forwarding of an ingress node which has received said  
frame to make an expansion frame, when applied said data  
frame is a frame to be broadcast, and

10 switch element which receives said expansion  
frame to transfer the frame to a path to each node on  
said network based on said forwarding information of  
said expansion tag.

51. A node in a network for transferring a data frame  
sent from a source on the network to a predetermined  
destination, comprising:

5 frame processing element which adds, to applied  
said data frame, an expansion tag containing information  
about forwarding to an egress edge node to said  
destination and customer information of said destination  
to make an expansion frame, and

10 switch element which receives said expansion frame to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag.

52. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 frame processing element which adds, to applied said data frame, a plurality of expansion tags containing information about forwarding to an egress edge node to said destination to make an expansion frame, and

10 switch element which receives said expansion frame to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top.

53. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 when applied said data frame is a frame to be broadcast, adding a plurality of expansion tags containing information about forwarding of an ingress node having received said frame to make an expansion frame, and

switch element which receives said expansion

10 frame to transfer the frame to a path to each node on said network based on said forwarding information of said expansion tag located at the top.

54. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 frame processing element which adds, to applied said data frame, a plurality of expansion tags containing information about forwarding to an egress edge node to said destination to make an expansion frame, and

10 switch element which receives said expansion frame to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top and when said forwarding information of said top expansion tag indicates that a node at the next hop belongs to a 15 different domain, transfer the frame to a path to a deletion circuit.

55. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 frame processing element which adds, to applied said data frame, a plurality of expansion tags containing information about forwarding to an egress

edge node to said destination to make an expansion frame, and

switch element which receives said expansion  
10 frame to transfer the frame to a path to said egress  
node based on said forwarding information of said  
expansion tag located at the top and when said  
forwarding information of said top expansion tag  
coincides with identification information of the node  
15 itself or of a domain to which the node itself belongs,  
transfer the frame to a path to a deletion circuit.

56. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

switch element which receives an expansion frame  
5 with an expansion tag including information about  
forwarding to an egress edge node to said destination to  
transfer the frame to a path to said egress node based  
on said forwarding information of said expansion tag.

57. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

switch element which receives an expansion frame  
5 with an expansion tag including forwarding information  
of an ingress edge node which has received said frame to  
transfer the frame to a path to each node on said

network based on said forwarding information of said expansion tag.

10

58. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 switch element which receives applied said data frame to transfer the frame to a path to each node on said network based on information of a VLAN tag of said data frame.

59. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 switch element which, when receiving an expansion frame with an expansion tag including forwarding information of an ingress edge node which has received said frame, transfers the frame to a path to each node on said network based on said forwarding information of said expansion tag and when receiving a data frame with 10 said VLAN tag added, transfers the frame to a path to each node on said network based on information of a VLAN tag of said data frame.

60. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 switch element which receives an expansion frame with an expansion tag including information about forwarding to an egress edge node to said destination and customer information of said destination to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag.

10

61. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 switch element which receives an expansion frame with a plurality of expansion tags including information about forwarding to an egress edge node to said destination to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top.

10

62. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

5 switch element which receives an expansion frame with a plurality of expansion tags including forwarding information of an ingress edge node which has received said frame to transfer the frame to a path to each node on said network based on said forwarding information of said expansion tag located at the top.

10

63. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

switch element which receives an expansion frame  
5 with a plurality of expansion tags including information about forwarding to an egress edge node to said destination to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top and when said  
10 forwarding information of said top expansion tag indicates that a node at the next hop belongs to a different domain, transfer the frame to a path to a deletion circuit.

64. A node in a network for transferring a data frame sent from a source on the network to a predetermined destination, comprising:

switch element which receives an expansion frame  
5 with a plurality of expansion tags including information about forwarding to an egress edge node to said destination to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top and when said  
10 forwarding information of said top expansion tag coincides with identification information of the node itself or of a domain to which the node itself belongs, transfer the frame to a path to a deletion circuit.

65. The node as set forth in claim 49, wherein  
said frame processing element including,  
a frame attribute detector for extracting frame  
attribute information of applied said data frame to an  
5 input port of the node,  
an expansion tag generator for generating said  
expansion tag based on said frame attribute information,  
and  
a frame converter for adding generated said  
10 expansion tag to applied said data frame to convert the  
frame into an expansion frame.
66. The node as set forth in claim 65, wherein  
said expansion tag generator includes:  
a correspondence information table in which  
information about correspondence between frame attribute  
5 information generated by said frame attribute detector  
and network information, and  
an expansion tag generation unit for, after  
reading network information corresponding to said frame  
attribute information from said correspondence  
information table based on said frame attribute  
10 information, generating an expansion tag based on said  
network information.
67. The node as set forth in claim 65, wherein

said frame converter,  
    when a data frame applied to an input port of  
said node is an Ethernet frame,  
    inserts said expansion tag after said destination  
MAC address.

68. The node as set forth in claim 65, wherein  
said frame converter includes:  
an expansion tag separation unit for, when said  
data frame is an Ethernet frame, separating said  
expansion tag from said expansion frame transferred from  
said frame switch, and  
an FCS calculation unit for recalculating an FCS  
of said Ethernet frame transferred from the expansion  
tag separation unit to rewrite the FCS.

10

69. The node as set forth in claim 49, further comprising

an expansion tag deletion circuit for deleting said expansion tag included in said frame with an expansion tag to output the frame as a data frame.

70. The node as set forth in claim 69, wherein  
said expansion tag deletion circuit includes:  
an expansion tag separation unit for separating  
said expansion tag from said expansion frame, and  
an FCS calculation unit for recalculating an FCS

of said Ethernet frame transferred from the expansion tag separation unit to rewrite the FCS.

71. The node as set forth in claim 49, wherein said switch element including,

5 a frame forwarding unit for receiving an expansion frame transferred from said frame processing element to obtain output port information based on network information stored in an expansion tag in said expansion frame, and

10 a packet switch unit for receiving an expansion frame and said output port information transferred from said frame forwarding unit to output said frame with an expansion tag to a port as set forth in said output port information.

72. The node as set forth in claim 71, wherein said frame forwarding unit includes:

5 an expansion tag information table indicative of correspondence between forwarding information in an expansion tag of said expansion frame received and output port information of said packet switch, and

10 a forwarding path search unit for extracting forwarding information from an expansion tag of said expansion frame received and referring to said expansion tag information table to obtain output port information from the forwarding information.

73. The node as set forth in claim 72, wherein  
said forwarding information is identification  
information composed of identifier information of said  
egress node or label information for reaching said  
5 egress node.

74. The node as set forth in claim 72, wherein  
said forwarding information is identification  
information composed of identifier information of said  
egress node or label information for reaching said  
5 egress node and additionally identifier information of  
said ingress node.

75. The node as set forth in claim 72, wherein  
said forwarding information is identification  
information composed of identifier information of said  
ingress node.

5  
76. The node as set forth in claim 72, wherein  
said forwarding information is identification  
information composed of identifier information of said  
egress node and identifier information of a domain in  
each hierarchy to which the node belongs or label  
5 information for reaching said egress node.

77. The node as set forth in claim 49, wherein

5 said ingress node in said network has a table which makes an address of said transfer destination and identification information of said egress node

10 correspond with each other and a table which makes identification information of said egress node and output port information correspond with each other,

15 a core node in said network has a table which makes identification information of said egress node and output port information correspond with each other, and

20 said egress node has a table which makes an address of said transfer destination and output port information correspond with each other and a table which makes identification information of said egress node and output port information correspond with each other.

25 78. The node as set forth in claim 49, wherein

30 said ingress node in said network has a table which makes an address of said transfer destination and identification information of said egress node

35 correspond with each other, a table which makes identification information of said egress node and

40 output port information correspond with each other, and a table which makes identification information of said ingress node and one or a plurality of output port

45 information correspond with each other,

50 a core node in said network has a table which makes identification information of said egress node and

15        output port information correspond with each other and a table which makes identification information of said ingress node and one or a plurality of output port information correspond with each other, and

20        said egress node has a table which makes an address of said transfer destination and output port information correspond with each other, a table which makes identification information of said egress node and output port information correspond with each other and a table which makes identification information of said ingress node and one or a plurality of output port information correspond with each other.

25

79.        The node as set forth in claim 49, wherein identification information of said ingress node is an existing VLAN tag value or a group identifier obtained by grouping a part of existing VLAN tags or a 5 group identifier obtained by grouping all the existing VLAN tags.

80.        The node as set forth in claim 49, wherein said ingress node in said network has a table which makes an address of said transfer destination, identification information of said egress node and 5 customer information of said transfer destination correspond with each other and a table which makes identification information of said egress node and

output port information correspond with each other,  
a core node in said network has a table which  
10 makes identification information of said egress node and  
output port information correspond with each other, and  
said egress node has a table which makes customer  
information of said transfer destination and output port  
information correspond with each other and a table which  
15 makes identification information of said egress node and  
output port information correspond with each other.

81. The node as set forth in claim 49, wherein  
said ingress node in said network has a table  
which makes an address of said transfer destination,  
identification information of said egress node and  
5 identification information of a domain in each hierarchy  
to which the node belongs correspond with each other,  
and a table which makes identification information of  
said egress node, identification information of a domain  
in each hierarchy to which the node belongs and output  
10 port information correspond with each other,

a core node in said network has a table which  
makes identification information of said egress node,  
identification information of a domain in each hierarchy  
to which the node belongs and output port information  
15 correspond with each other, and

said egress node has a table which makes an  
address of said transfer destination and output port

information correspond with each other, and a table  
which makes identification information of said egress  
node, identification information of a domain in each  
hierarchy to which the node belongs and output port  
information correspond with each other.

82. In a network for transferring a data frame sent  
from a source on the network to a predetermined  
destination, a frame transfer program executed on a node  
in the network for controlling transfer of said data  
frame, comprising the functions of:

adding, to applied said data frame, an expansion  
tag containing information about forwarding to an egress  
edge node to said destination to make an expansion frame,  
and

receiving said expansion frame to transfer the  
frame to a path to said egress node based on said  
forwarding information of said expansion tag.

83. In a network for transferring a data frame sent  
from a source on the network to a predetermined  
destination, a frame transfer program executed on a node  
in the network for controlling transfer of said data  
frame, comprising the functions of:

when applied said data frame is a frame to be  
broadcast, adding an expansion tag containing  
information about forwarding of an ingress node having

10 received said frame to make an expansion frame, and  
receiving said expansion frame to transfer the  
frame to a path to each node on said network based on  
said forwarding information of said expansion tag.

84. In a network for transferring a data frame sent  
from a source on the network to a predetermined  
destination, a frame transfer program executed on a node  
in the network for controlling transfer of said data  
frame, comprising the functions of:

10 adding, to applied said data frame, an expansion  
tag containing information about forwarding to an egress  
edge node to said destination and customer information  
of said destination to make an expansion frame, and  
receiving said expansion frame to transfer the  
frame to a path to said egress node based on said  
forwarding information of said expansion tag.

85. In a network for transferring a data frame sent  
from a source on the network to a predetermined  
destination, a frame transfer program executed on a node  
in the network for controlling transfer of said data  
frame, comprising the functions of:

adding, to applied said data frame, a plurality  
of expansion tags containing information about  
forwarding to an egress edge node to said destination to  
make an expansion frame, and

10 receiving said expansion frame to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top.

86. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the functions of:

5 when applied said data frame is a frame to be broadcast, adding a plurality of expansion tags containing information about forwarding of an ingress node having received said frame to make an expansion frame, and

10 receiving said expansion frame to transfer the frame to a path to each node on said network based on said forwarding information of said expansion tag located at the top.

15 87. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the functions of:

5 adding, to applied said data frame, a plurality of expansion tags containing information about

forwarding to an egress edge node to said destination to make an expansion frame,

10 receiving said expansion frame to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top, and when said forwarding information of said top expansion tag indicates that a node at the next hop 15 belongs to a different domain, transferring the frame to a path to a deletion circuit.

88. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node of the network for controlling transfer of said data frame, comprising the functions of:

adding, to applied said data frame, a plurality of expansion tags containing information about forwarding to an egress edge node to said destination to make an expansion frame,

10 receiving said expansion frame to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag located at the top, and when said forwarding information of said top expansion tag coincides with identification 15 information of the node itself or of a domain to which the node itself belongs, transferring the frame to a path to a deletion circuit.

89. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the function of:

receiving an expansion frame with an expansion tag including information about forwarding to an egress edge node to said destination added to applied said data frame to transfer the frame to a path to said egress node based on said forwarding information of said expansion tag.

90. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the function of:

receiving an expansion frame with an expansion tag including forwarding information of an ingress edge node which has received said frame added to applied said data frame to transfer the frame to a path to each node on said network based on said forwarding information of said expansion tag.

91. In a network for transferring a data frame sent from a source on the network to a predetermined

destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the function of:

transferring the frame to a path to each node on said network based on information of a VLAN tag added to applied said data frame.

92. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the function of:

when receiving an expansion frame with an expansion tag including forwarding information of an ingress edge node which has received said frame added to applied said data frame, executing processing of transferring the frame to a path to each node on said network based on said forwarding information of said expansion tag and when receiving a data frame with said VLAN tag added, transferring the frame to a path to each node on said network based on information of the VLAN tag added to said data frame.

93. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data

5 frame, comprising the function of:

receiving an expansion frame with an expansion tag including information about forwarding to an egress edge node to said destination and customer information of said destination added to applied said data frame to 10 transfer the frame to a path to said egress node based on said forwarding information of said expansion tag.

94. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data 5 frame, comprising the function of:

receiving an expansion frame with a plurality of expansion tags including information about forwarding to an egress edge node to said destination added to applied said data frame to transfer the frame to a path to said 10 egress node based on said forwarding information of said expansion tag located at the top.

95. In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data 5 frame, comprising the function of:

receiving an expansion frame with a plurality of expansion tags including forwarding information of an

10        ingress edge node which has received said frame added to applied said data frame to transfer the frame to a path to each node on said network based on said forwarding information of said expansion tag located at the top.

96.        In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the function of:

5            receiving an expansion frame with a plurality of expansion tags including information about forwarding to an egress edge node to said destination added to applied said data frame to transfer the frame to a path to said 10 egress node based on said forwarding information of said expansion tag located at the top and when said forwarding information of said top expansion tag indicates that a node at the next hop belongs to a different domain, transfer the frame to a path to a 15 deletion circuit.

97.        In a network for transferring a data frame sent from a source on the network to a predetermined destination, a frame transfer program executed on a node in the network for controlling transfer of said data frame, comprising the function of:

5            receiving an expansion frame with a plurality of

expansion tags including information about forwarding to  
an egress edge node to said destination added to applied  
said data frame to transfer the frame to a path to said  
10 egress node based on said forwarding information of said  
expansion tag located at the top and when said  
forwarding information of said top expansion tag  
coincides with identification information of the node  
itself or of a domain to which the node itself belongs,  
15 transfer the frame to a path to a deletion circuit.